

Possible procedure to constrain
growth rates given site-specific data

10/24/2018

Existing Methods

Length-based Methods in Fisheries Research, edited by Daniel Pauly, G. R. Morgan 1987

P 364: “Successful estimation of growth parameters from catch lengths frequencies alone is highly dependent on the extent to which the modes associated with individual cohorts (i.e., year-classes) in those frequencies are distinguishable.”

“... most difficult for older fish which may grow more slowly”

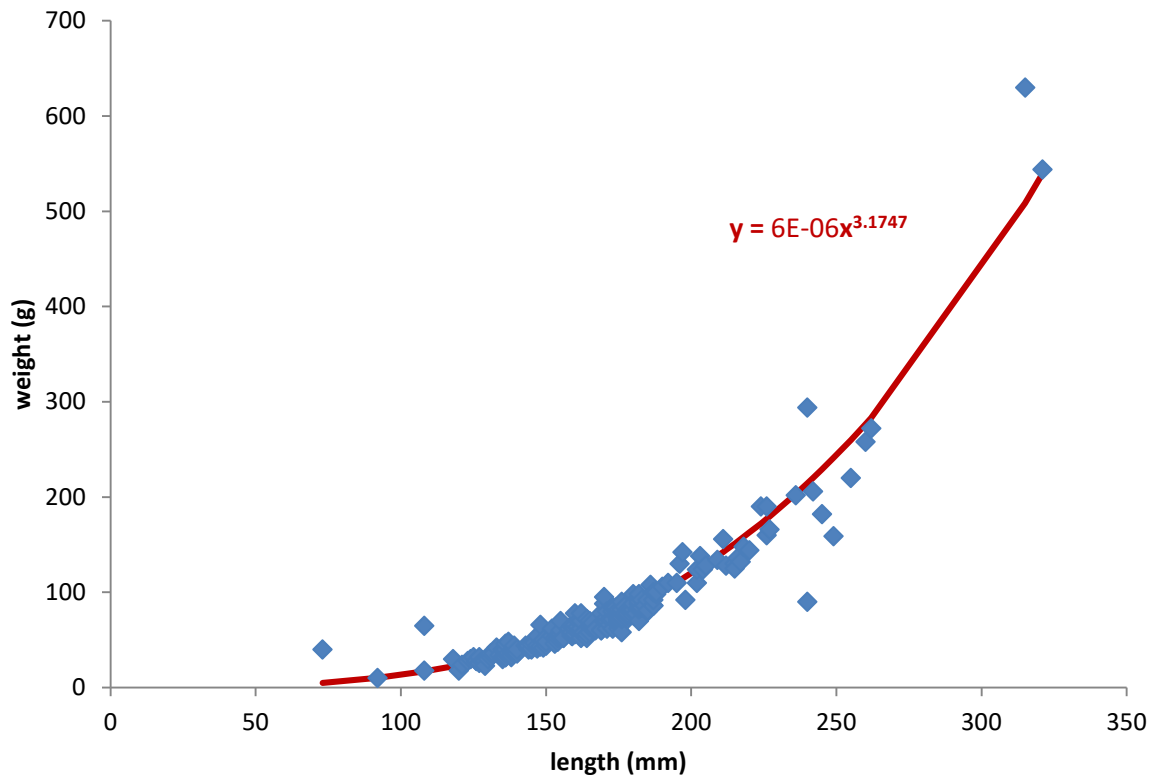
Don't see that LPR data support this method, but it could be kept in mind if modes are visible.

Proposed Steps

- Select length/weight data most applicable to weight being modeled (omit YOY in some cases)
- Predict minimum and maximum age for those data
- Distribute data into age classes using length, and minimum and maximum constraints
- Calculate growth rate using trend line
- Bound this rough estimate with
 - “widest likely” age range for slowest growth rate and
 - “narrowest” age range for fastest growth rate

Example for Perch

- Modeling 81 g fish, threw out weights <10 g
- n=224



Perch age to length from
Bath and O'Connor 1982

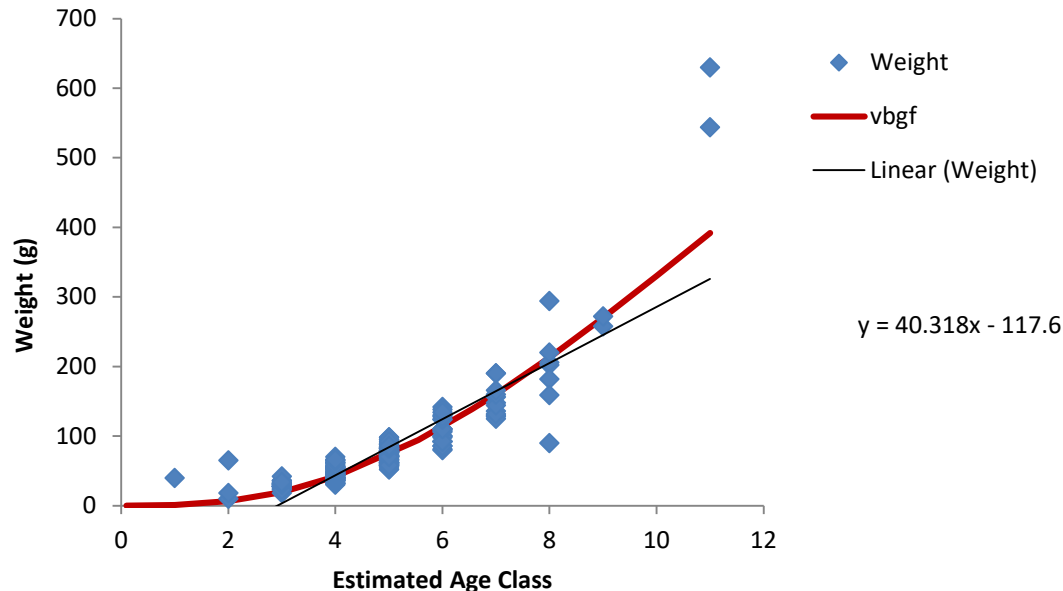
	0	1
	100	2
	125	3
	150	4
	167	5
	183	6
	200	7

Perhaps age range
1-11 based on reference
but uncertain

Perch Example (2)

- Distribute Age class by Length and assumed min/max ages

Growth	40 grams/year
	43% g/g year



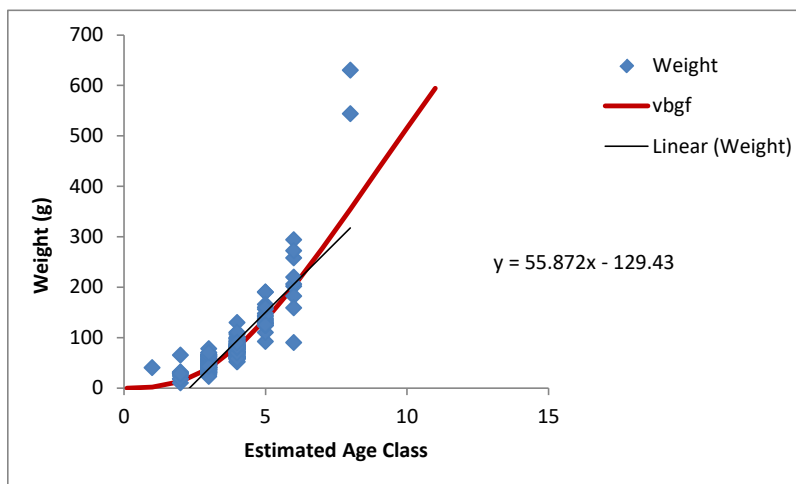
Perch Example (3)

- Repeat with other min/max age assumptions

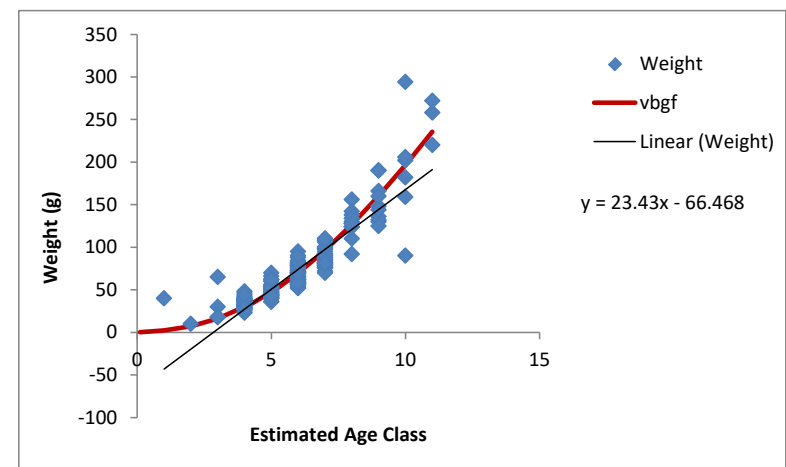
	growth Pct/yr		
Min Growth	24.9%g/g yr	assume age 1-11...	Omit 2 fish >500 g
Likely Growth	42.9%g/g yr	assume age 1-11	
Max Growth	59.4%g/g yr	assume age 1-8	
Gewurtz Growth	86.0%g/g yr	for 94 g fish	

Fitting data with linear or Von-Bertalanffy growth functions yields similar growth-rate estimates

Data from fish aged 1-8 years



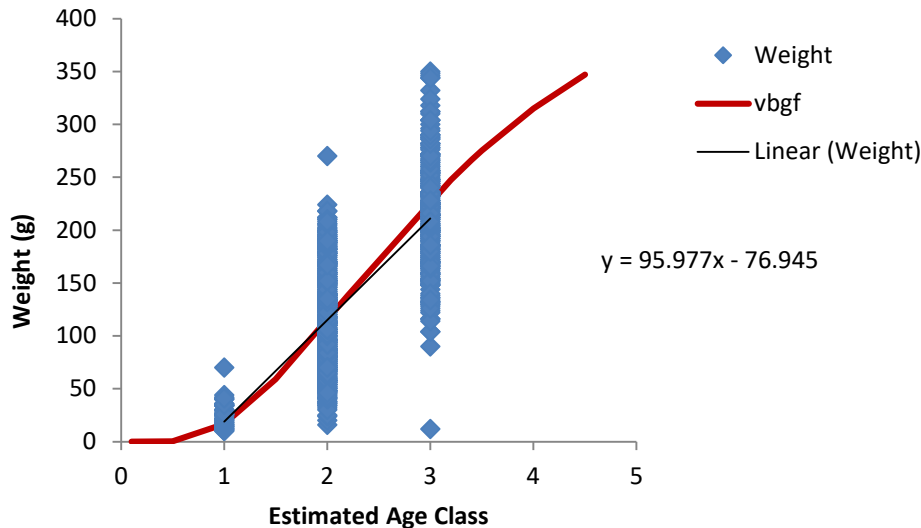
Data from fish aged 1-11 but omit two outliers



Blue Crab Results

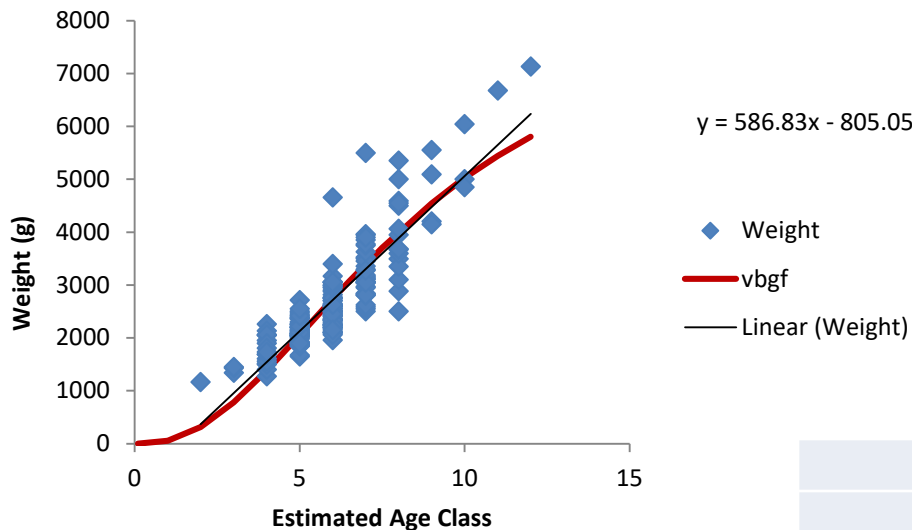
- n=919; one outlier omitted (*length 25mm, weight 680g*)
- Literature: Darnell et al, 2009 and Hines et al 2003 for life-spans
 - “2.5–3.5 years total lifespan”
 - “Previous estimates of blue crab mature lifespans range from 1 to 4 yr”

	growth Pct/yr		
Min Growth	62.0%	g/g yr	age 1-4
Likely Growth	68.6%	g/g yr	age 1-3
Max Growth	76.0%	g/g yr	age 1-2
Gewurtz Growth	69.0%	g/g yr	140 g crab



Carp Results

- n=193; omitted one YOY outlier (*length 65mm, w 7g*)
- Modeling growth rate of 3100 g carp



	growth Pct/yr		
Min Growth	14.5% g/g yr		assume age 1-14
Likely Growth	18.9% g/g yr		assume age 2-12
Max Growth	29.1% g/g yr		assume age 2-8
Gewurtz Growth	34.0% g/g yr		for 3100 g fish

Distribute Growth Through Year

- Dormant during winter, growth during other seasons?
- Blue Crab data from Ju et al 2001:
- (Note growth faster in artificial pond than other field estimates)

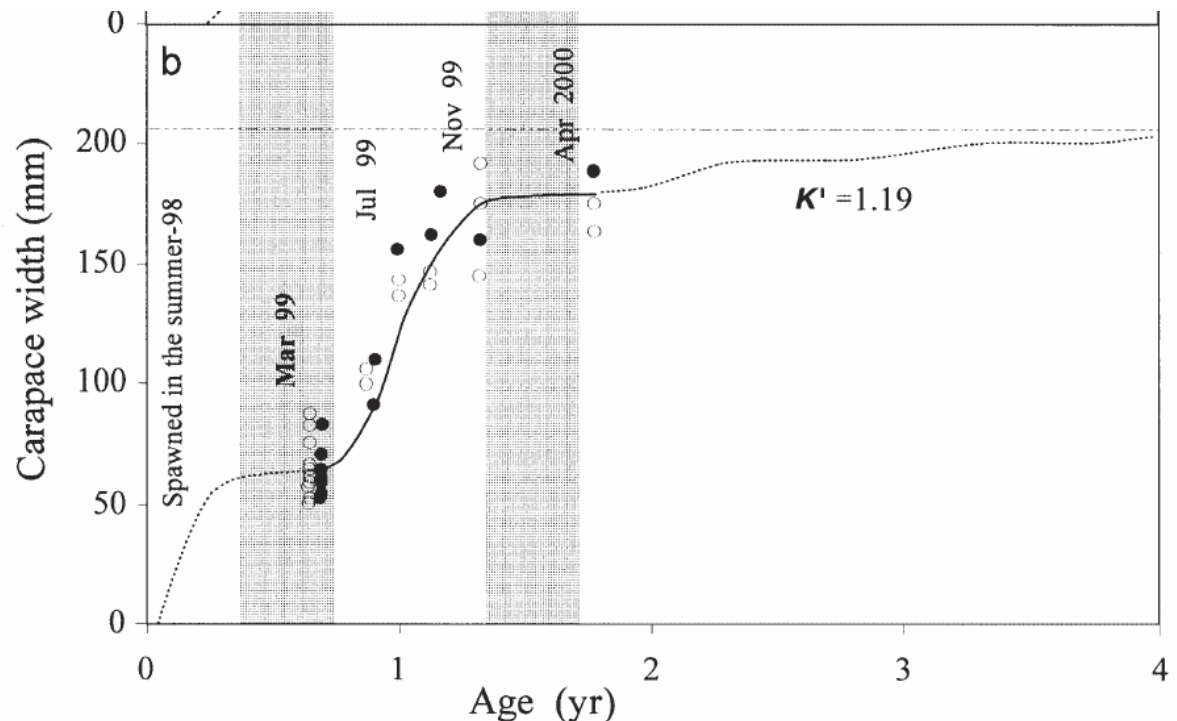


Fig. 4. Growth of pond-reared *Callinectes sapidus* with seasonalized von Bertalanffy growth curves. (a) Growth of crabs (assumed spawn-

Shaded grey: water temperature <10 deg C. No growth